Claims 30 to 33 depend upon new Claim 28 and otherwise correspond to Claims 5, 7, 15 and 14, respectively. No new matter has been added.

The Examiner objected to the specification for lacking section headings, a brief description of the drawings, and a description of Figure 4. Applicants have amended pages 1 to 3 and 14 to include the missing section headings and descriptions, and withdrawal of the Examiner's objection is therefore respectfully solicited.

The Examiner rejected Claims 2, 3 and 19 under 35 U.S.C. §112, ¶2, for referring to "*the cavity*" without providing proper antecedent basis. Withdrawal of the respective rejection is respectfully solicited in light of the changes effected in Claims 1 and 18 which, inter alia, introduce the antecedent basis for the reference to "*the cavity*" in the claims from which Claims 2, 3 and 19 depend. Favorable action is solicited.

The Examiner rejected Claims 1, 7, 14, 15, 18, 20, 25 and 26 under 35 U.S.C. §102(b) as being anticipated by the teaching of ***Cresham*** (GB 2 272 913). Applicants have amended Claims 1 and 18 to recite the elements set forth in Claims 16 and 17 and in Claims 24 and 27, respectively, and Claims 7, 14, 15, 20, 25 and 26 depend either directly or indirectly on Claim 1 or Claim 18. The Examiner's rejection is therefore no longer applicable and withdrawal of the rejection is respectfully solicited.

The Examiner rejected Claims 18 and 19 under 35 U.S.C. §102(b) as being anticipated by the teaching of ***Durazzani*** (US 5,419,167). The Examiner'S rejection is obviated since applicants amended 18 to include the elements set forth in Claims 24 and 27, and Claim 19 depends on Claim 18. Withdrawal of the respective rejection is therefore respectfully solicited.

The Examiner rejected Claims 8, 16, 23 and 27 under 35 U.S.C. §103(a) as being unpatentable in light of the teaching of ***Cresham*** (ibid.), and Claims 23 and 24 under 35 U.S.C. §103(a) as being unpatentable in light of the teaching of the teaching of ***Durazzani*** (ibid.). The respective claims have been canceled, and withdrawal of the rejection is therefore respectfully solicited.

The Examiner rejected Claims 5, 6, 21 and 22 under 35 U.S.C. §103(a) as being unpatentable in light of the teaching of ***Cresham*** (ibid.), optionally together with the teaching of ***Durazzani*** (ibid.), when taken in view of the disclosure of ***Elbert et al.*** (DE 197 22 339). Claims 5, 6, 21 and 22 depend on Claim 1 or Claim 18 and, therefore, incorporate by reference the elements of former Claims 16 and 17 and in Claims 24 and 27, respectively. The Examiner's rejection is therefore no longer applicable and withdrawal of the rejection is respectfully solicited.

Additionally, the Examiner rejected Claims 1 to 3, 7 to 17, 20 and 25 under 35 U.S.C. §103(a) as being unpatentable in light of the teaching of ***Durazzani*** (ibid.) when taken in view of the disclosure of ***Cresham*** (ibid.). To the extent that the subject matter of Claims 20 and 25 is concerned the respective issue is deemed to have been obviated by the changes effected in Claim 18 from which Claims 20 and 25 depend.

As regards the Examiner's reasons for finding that Claims 1 to 3 and 7 to 17 are rendered obvious by the referenced art, the following is respectfully submitted.

The Examiner noted, with a particular view to the elements of Claims 16 and 17 which are now recited in Claim 1, that the references failed to disclose the wall thickness of the inner and the outer wall and the thickness of the cavity between those walls and argued that it would have been an obvious matter of design choice to adopt the parameters set forth in applicants' claims since applicants failed to disclose that the wall thickness and/or the cavity dimension solve any stated problem or are for a particular purpose.[2)]

Applicants respectfully disagree. Applicants have summarized the problems which are encountered with drum-shaped inner containers for household articles at the outset of the application.[3)] It is, for example, pointed out that the walls of such containers, and in particular the container wall to which a bearing is applied or introduced, are required to exhibit a particular strength in order to withstand flexual load and to avoid excessive deformation.[4)] Moreover, applicants have pointed out in that context that the single wall designed containers made from polymer material required a certain thickness of the wall to ensure the necessary stability, and that factors such as increased material costs due to the amounts of polymer needed, as well as long solidification times increased the expenditure incurred in the manufacture of such containers.[5)] In light of this background, applicants invention provides a container comprising at least one double walled portion, ie. an inner wall and an outer wall and a cavity situated between the inner and the outer wall with a shear resistant connection between the two walls,[6)] which allows for the thickness of the respective walls, and correspondingly the expenditure incurred in the manufacture of the container, to be reduced while, at the same time, conveying sufficient stability to the container to be capable of being operated at increased spin rotation rates and/or with an increased unbalanced mass.[7)] The Examiner's position that applicants failed to disclose that the wall thickness and/or the cavity dimension solve any stated problem or are for a particular purpose is therefore not deemed to be well taken.

Moreover, it is respectfully urged that the information which is conveyed by the references relied upon by the Examiner is not such that the particularities of applicants' container are rendered obvious within the meaning of Section 103(a).

The Examiner asserts that ***Durazzani*** disclose a drum shaped container in which (3) and (4) represent an inner wall, (5) and the outer surface of (8) represent an outer wall, (10) and (12) represent a shear resistant connection between the inner and the outer wall, and (6) represents a cavity between

2) Cf. Nos. 18 and 19 on pages 7 and 8 of the Office action.

3) Cf. in particular page 1, indicated line 40, to page 2, indicated line 31, of the application.

4) Cf. also page 1, indicated lines 11 to 15, of ***GB 2 272 913***.

5) Cf. in particular, page 1, indicated line 42, to page 2, indicated line 7, of the application.

6) Cf. Claim 1.

7) Cf. page 2, indicated lines 33 to 46, of the application.

the inner wall and the outer wall. It is respectfully noted that a surface is not a wall but rather a part of a wall. A reference to the outer surface of (8) as a wall is, therefore deemed to distort the information which is reasonably provided by ***Durazzani***. It is further noted that (5) is located inside of (8) so that the part designated by ***Durazzani*** as (5) cannot reasonably be considered as an outer wall. Last but not least, the cavity (6) is formed by the part (8) rather than being located between an inner wall and an outer wall. Accordingly, the teaching of ***Durazzani*** is not deemed to show the elements of applicants' container in the manner asserted by the Examiner. The Examiner applies the teaching of ***Cresham*** for suggesting the use of reinforced polypropylene for the manufacture of the plastic tub addressed by the teaching of ***Durazzani***. The teaching of ***Cresham*** is, to that extent, however, not suited to provide for a suggestion or motivation as is necessary to redesign the tub of ***Durazzani*** as is necessary at applicants' container, ie. to include at least one double walled portion, that is an inner wall and an outer wall and a cavity situated between the inner and the outer wall with a shear resistant connection between the two walls. Three basic criteria have to be met in order to establish a *prima facie* case of obviousness:[8)]

(1) There must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings,

(2) there must be a reasonable expectation of success, and

(3) the prior art reference or the combined references must teach or suggest all of the claim limitations.

Additionally, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and cannot be based on applicants' disclosure.[9)] At least the requirements (1) and (3) are not met here.

The Examiner interpreted the teaching of ***Cresham*** as showing a container having an inner wall (2, 3) and an outer wall (4) joined with a shear resistant connection (14). However, (2) of ***Cresham***'s container designates the side wall, and (3) and (4) of ***Cresham***'s container designate the end walls of the container.[10)] Moreover, none of the walls (2), (3) and (4) are construed to comprise a one double walled portion, that is an inner wall and an outer wall and a cavity situated between the inner and the outer wall with a shear resistant connection between the two walls. An interpretation of ***Cresham***'s figures to illustrate such a construct is inconsistent with the information provided on page 4, indicated lines 7 to 9, of the reference. The "***Greek Fan***" construction which is referenced there

8) Cf. MPEP §2143.

9) *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438, 1442 (Fed. Cir. 1991).

10) Cf. page 2, indicated lines 18 to 20, of *GB 2 272 913*.

as being described in EP 97 483.[11] According to the referenced art, the Greek Fan construction is essentially a plate having depressed segments, designated as (3) in Figures 1, 2 and 4, and elevated segments (2). Both depressions and elevations are further stabilized by ribs (7), cf. Figures 1 and 3, extending from one wall segment (4) to the next, cf. Figures 1, 2 and 3. Focusing on the upper part of Figure 3 of EP 97 483 which corresponds to sections of the end walls (3) and (4) of *Cresham's* container it becomes apparent that (3) of EP 97 483 is not an inner wall but merely a depressed segment of the wall which is located underneath the paper level, and (2) of EP 97 483 is not an outer wall but merely an elevated segment of the wall which is located above the paper level. The attached shows that the ribs (7) of EP 97 483, and the corresponding ribs (35) and (36) referenced by *Cresham* fail to connect an inner wall and an outer wall and a cavity situated between the inner and the outer wall with a shear resistant connection between the two walls.

In light of the foregoing, the teachings of *Durazzani* and of *Cresham* fail to teach or suggest all of the claim limitations, and the suggestion or motivation is lacking to make the changes which are necessary in order to arrive at the features which characterize the containers disclosed and claimed by applicants. It is therefore respectfully requested that the rejection of Claims 1 to 3, 7 to 17 under 35 U.S.C. §103(a) as being unpatentable in light of the *Durazzani* and the *Cresham* reference be withdrawn. Favorable action is solicited.

Please charge any shortage in fees due in connection with the filing of this paper, including Extension of Time fees, to Deposit Account No. 14.1437. Please credit any excess fees to such deposit account.

Respectfully submitted,
NOVAK DRUCE DELUCA & QUIGG

Jason D. Voight
Reg. No. 42,205

1300 Eye Street, N.W.
Suite 400 East Tower
Washington, D.C. 20005
(202) 659-0100

Encl.: SPECIFICATION AMENDMENTS (Appendix I)
CLAIM AMENDMENTS (Appendix II)
Copy of EP 0097 483

JDV/BAS

11) A copy of the reference is herewith enclosed for the Examiner's convenience. The Examiner's attention is in particular drawn to the figures which are further explained in the following.

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(71) Applicant: REED INTERNATIONAL P.L.C.
82, Piccadilly
London, W1A 1EJ(GB)

(72) Inventor: Hancock, Frank John Thompson
Heath Lodge Elm Grove
Alderley Edge Cheshire(GB)

(74) Representative: Rushton, Ronald et al,
SOMMERVILLE & RUSHTON 11 Holywell Hill
St. Albans Hertfordshire AL1 1EZ(GB)

(54) Wash tubs.

(57) Wash tubs for domestic front loading washing machines, where rigidity of the back plate supporting the rotatable drum is an essential requisite, are made more rigid, quicker, stronger and cheaper as solid mouldings than as structural foam mouldings, the latter being the accepted norm for maximising panel stiffness. Preferred materials are fibre reinforced thermoplastic compositions free from blowing agents. The back plates are moulded in a Greek Fan configuration comprising a plurality of sectors adjacent ones of which are relatively displaced axially of the wash tub and are joined at their radial edges by axially extending webs, the sectors preferably being thicker than the webs.

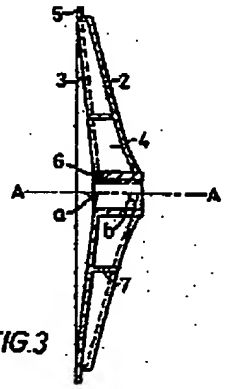



FIG.3

EP 0 097 483 A2

0097483

Wash Tubs

The invention relates to wash tubs suitable for use in domestic front loading washing machines for laundering clothes, and in particular to wash tubs moulded, at least in part, from plastics materials.

Washing machines of this kind are provided with a wash tub within which is mounted a rotatable drum for holding the clothes to be washed. The wash tubs are usually substantially cylindrical in shape with a back plate closing one end of the tub and a water-retaining flange at the other end of the tub, the tubs also having various lugs or brackets for mounting them in an outer casing.

To avoid requiring excessive amounts of water, during washing, it is desirable to have minimum clearance between the rotatable drum and the wash tub. However, the drum of a front loading machine is mounted solely on a bearing located at the centre of the back plate of the tub, and this may be subjected to strong mechanical stresses, especially during spin drying of an out-of-balance washing load. Any small flexing which occurs in the back plate is magnified at the open end of the drum, so that small clearances there may be lost, usually with catastrophic results.

Flexing of the back plate is generally more difficult to

prevent in tubs moulded from plastics materials than in those using traditional metals, and current designs have tackled this problem by using back plates having particularly stiff spatial configurations, and by using moulding compositions and procedures which are well known techniques for obtaining stiffer products. Thus the preferred shape which has been developed is that often referred to as a "Greek Fan" and comprises a plurality of sectors, typically between twelve and eighteen in number. The inner end of each sector adjacent the bearing for the drum is displaced axially of the tub with respect to the adjacent sectors. There is usually little or no relative axial displacement at the outer ends of the adjacent sectors. Adjacent sectors are inter-connected along their radial edges by axially extending webs; thus an annular section of the back plate at part radius has a castellated configuration.

It is a well known general principle in plastics technology, that a foamed moulding, by virtue of its greater thickness, will have a greater panel stiffness than an unfoamed panel of the same weight. It is therefore not surprising that with the intention of obtaining maximum panel stiffness, wash tub back plates are currently being moulded from plastics compositions containing foaming agents to produce relatively thick foamed panels, e.g. as a foamed core with substantially solid skins on either side often referred to as "Structural Foam".

However, as a basis for this invention it has now been found that for wash tub back plates in a Greek Fan configuration, panel stiffness is not the critical parameter in determining its overall rigidity. The major stresses are tensile and compressive rather than bending. Consequently a more rigid back plate with less material and shorter moulding cycles, and hence at substantially lower cost, can be obtained by producing thinner panels without using a foaming cycle.

Accordingly, the present invention provides a wash tub for a front loading washing machine in which the back plate has a Greek Fan configuration comprising a plurality of sectors adjacent ones of which are relatively displaced axially of the tub and are joined along their radial adges by axially extending webs, the back plate being moulded from a plastics composition which is free from foaming agents.

A preferred wash tub is one having a tubular shell which is integrally moulded with the back plate from the same plastics composition which is free from foaming agent. The tubular shell preferably has a slight taper, e.g. about 4°, to assist in its removal from the moulding tool. It can also have a stepped radius, strengthening ribs and mounting lugs.

A number of advantages accrue from the present invention. For example, the strength of a solid moulding is more predictable than that of a foamed moulding which has to be

over-engineered to some extent to ensure adequate strength. A further requirement which is satisfied by the invention is that the back plate must not only be stiff, but it must have sufficient strength to withstand the repeated substantial loadings around the drum-supporting bearing without fracture. It has been found that when using a foaming composition, it was unfortunately in these most highly stressed areas where most foaming occurs during moulding. Moreover, the very presence of foaming agent necessitates longer cycle times to prevent post moulding blowing, with a result that for this particular shape, any saving in material cost which might have been achieved by foaming would be small, and the additional production costs can be a greater effect. Indeed, this can be exacerbated when demand for a high production rate can only be met on the longer foaming cycles by using additional moulding tools.

In practice a back plate is preferred in which the thickness of the sectors is greater than the thickness of their interconnecting webs. Advantageously the thickness of the sectors is between 5 mm. and 6 mm. The thickness ratio of web to sector lies preferably within the range 0.75 to 0.9, especially about 0.8. Thus, for example, 5.5 mm. thick solid sectors combined with only 4.5 mm. thick interconnecting webs, give a strong and stiff back plate configuration for moulding from 30% glass filled polypropylene. Also, advantageously the thickness of the cylindrical shell portion

of the wash tub is less than the thickness of the sectors and is, for example, the same as the thickness of the axially extending webs.

The sectors of the back plate are preferably all orientated with their planes at an angle of less than 90° to the axis of rotation of the drum and all slope in the same direction. This is in contrast to known Greek Fan back plates the planes of whose sectors slope in opposite directions. The angle of orientation of alternate sectors is preferably less than that of the other sectors therebetweeen by an amount within the range 5 to 25°, such that the outer ends of adjacent sectors are closer together than the inner ends of adjacent sectors.

It has also been found that rigidity may be improved by providing part way along the radius of the sectors an annular web joining together the axially extending webs, the annular web being coaxial with the axis of drum rotation. The annular web is most suitably at a radius of between one quarter and one half, preferably about one third, the radius of the back plate, and the axial length of the web is preferably equal to the axial length of the interconnecting webs at the same radius.

Preferred plastics compositions are fibre reinforced thermoplastics materials, especially glass filled polypropylene containing at least 20% by weight of glass fibres.

The invention is further illustrated by reference to a specific embodiment thereof shown in the accompanying drawings, in which

Figure 1 is an axial view of a back plate according to the invention,

Figure 2 is a section along the line II II of Figure 1,

Figure 3 is a section along the line III III of Figure 1, and

Figure 4 is a detail of Figure 3 modified to show an alternative configuration.

The back plate 1 shown in the drawings has a Greek Fan configuration comprising a plurality of sectors 2, 3 displaced from each other along the axis A-A of the wash tub those marked 2 in Figure 1 being closer to the viewer than those marked 3. Adjacent sectors 2 and 3 are interconnected along their radial edges by axially extending webs 4, as shown in the section of Figure 2. The thickness 'X' of the sectors 2, 3 is greater than the thickness 'Y' of the webs 4.

The planes of the sectors 2 and 3 slope at angles 'a' and 'b', both less than $90^{o}$, with respect to the axis A-A and they all slope in the same direction, i.e. towards the open mouth of the wash tub. The difference between the angles 'a' and 'b' is in the range 5 to $25^{o}$.

Around the circumference is a flange 5, which is joined to all the sectors 2 and 3 and their interconnecting webs 4, and is provided for bolting the back plate to a separately formed tubular shell (not shown). The inner ends of the sectors 2 and 3 are joined to a hub 6 for housing a drum-supporting bearing (not shown), adjacent sectors being connected to opposite ends of the hub, as shown in Figure 3. At about one third of the back plate radius, is an annular web 7, which is joined to each of the webs 4.

A back plate substantially as illustrated was injection moulded from a polypropylene compositon containing 30% by weight of glass fibre, and in the absence of any blowing agent it emerged as a single integral moulding of solid plastics composition. The diameter of the back plate was 470 mm., plus a 35 mm. flange 5 around its circumference. The thickness of the sectors 2, 3 was 5.5 mm., with the interconnecting webs 4 and tubular web 7 being thinner at 4.5 mm.

The modification shown in Figure 4 is a suitable edge configuration when moulding a tubular shell together with the back plate as an integral moulding. A portion of the shell 8 is shown in section, joined to radial segments 2, 3 and interconnecting web 4. No circumferential flange is needed with such integral mouldings, but supporting brackets and other standard fittings can be moulded on to the outer

surface of the shell, as required. The shell 8 is shown as having a thickness 'Y' the same as the webs 4.

CLAIMS

1. A wash tub for a front loading washing machine having a back plate comprising a plurality of sectors adjacent ones of which are relatively displaced axially of the tub and are joined along their radial edges by axially extending webs, the back plate being moulded from a plastics composition which is free from foaming agents.

2. A wash tub according to Claim 1, and comprising a tubular shell which is integrally moulded with the back plate from the same plastics composition which is free from foaming agent.

3. A wash tub according to Claim 1 or 2, wherein the thickness of the sectors is greater than the thickness of the axially extending webs.

4. A wash tub according to Claim 3, wherein the sectors have a thickness in the range 5 mm. to 6 mm.

5. A wash tub according to Claim 3 or 4 wherein the thickness ratio of web to sector lies within the range 0.75 to 0.9.

6. A wash tub according to any one of Claims 3 to 5, and having a tubular shell whose wall thickness is less

than the thickness of the sectors.

7. A wash tub according to Claim 6, wherein the wall thickness of the tubular shell is the same as the thickness of the axially extending webs.

8. A wash tub according to any one of the preceding Claims wherein the sectors of the back plate are all orientated with their planes at an angle of less than 90° to the axis of the rotation of the drum.

9. A wash tub according to Claim 8 wherein the angle of orientation of alternate segments is less than that of the other segments therebetween by an amount within the range 5 to 25°, such that the outer ends of the sectors lie in planes closer together than the inner ends of the sectors.

10. A wash tub according to any one of the preceding Claims wherein the plastics composition is a fibre reinforced thermoplastics material.

11. A wash tub according to Claim 10, in which the plastics composition is a glass filled polypropylene containing at least 20% by weight of glass fibres.

FIG.1

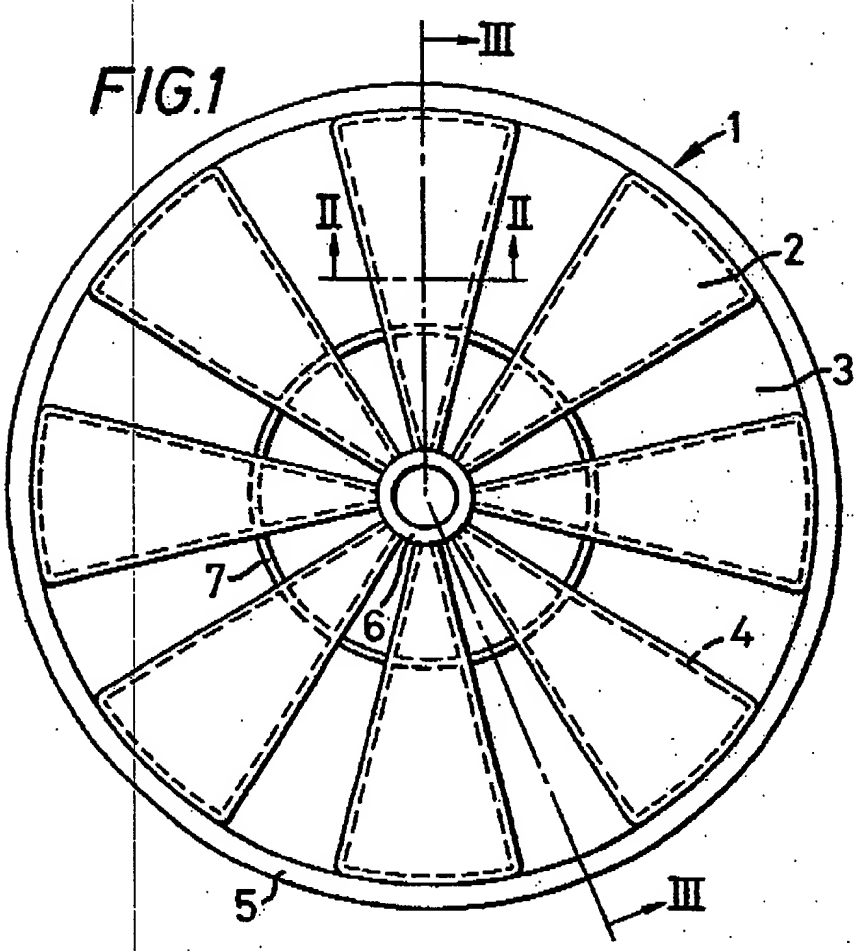
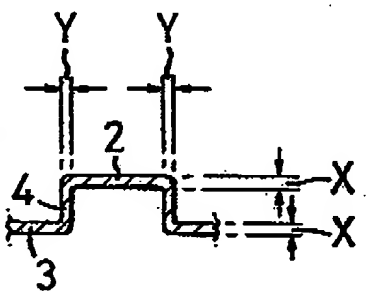



FIG.2



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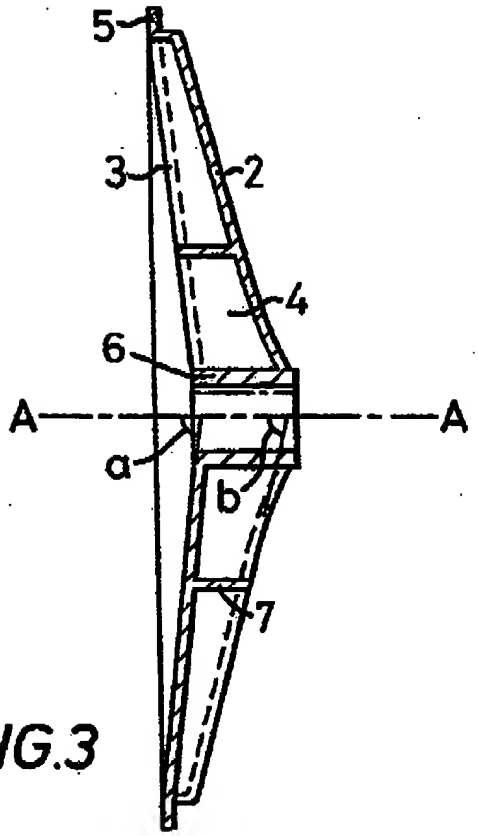


FIG.3

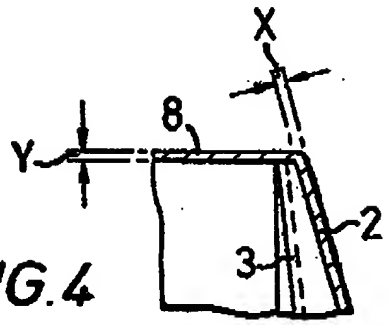


FIG.4